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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|------------------------------|------------------|
| 10/615,583 | 07/08/2003 | Timothy J. Daniel | Buckfeller 15-3-3-26/0759 | 8978 |
| 29391 | 7590 | 04/14/2005 | EXAMINER LEE, HSIEN MING | |
| BEUSSE BROWNLEE WOLTER MORA & MAIRE, P. A. 390 NORTH ORANGE AVENUE SUITE 2500 ORLANDO, FL 32801 | | | ART UNIT 2823 | PAPER NUMBER |

DATE MAILED: 04/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-----------------|---------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/615,583 | DANIEL ET AL. | |
| | Examiner | Art Unit | |
| | Hsien-ming Lee | 2823 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 04 February 2005.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-26 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-26 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 04 February 2005 is/are: a) accepted or b) objected to by the Examiner.

corrected

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

HSIEN-MING LEE
PRIMARY EXAMINER

4/2/05

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: _____

DETAILED ACTION

Remarks

1. The objection to drawings and specification are withdrawn.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claim 1 is rejected under 35 U.S.C. 102(a) as being anticipated by Parkhe (US 6,853,533).

Parkhe, in Figs. 1 and 2B and corresponding text, teaches the claimed method for depositing material on a semiconductor wafer 102, wherein the wafer temperature is maintained within a temperature range, the method comprising:

- providing a target 116 comprising the material to be deposited (col. 4, lines 45-46);
- supporting the wafer 102 on a chuck assembly 109 (col. 4, lines 18-20) wherein the wafer 102 is positioned between the target 116 and the chuck assembly 109;
- depositing material from the target 116 on the wafer 102 response to particles impinging the target 116; and
- controlling the wafer temperature within the temperature range in response to heat flow from the chuck 105 to the wafer 102, wherein the chuck assembly 109

comprises heater electrodes 222, which would generate heat flow and transfer to the wafer 102 and thus to control the wafer temperature (col. 9, lines 18-29).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 1-6 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (i.e. applicant's admitted prior art) in view of Parkhe.

In re claim 1, AAPA, in Figs. 1-2 and related text, teaches the claimed method for depositing material on a semiconductor wafer, wherein the wafer temperature is maintained within a temperature range, the method comprising:

- providing a target 102 comprising the material to be deposited;
- supporting the wafer 106 on a chuck 126 wherein the wafer 106 is positioned between the target 102 and the chuck 126;
- depositing material from the target 102 on the wafer 106 response to particles impinging the target 102; and
- controlling the wafer temperature within the temperature range by controlling the chuck temperature (page 4, paragraph [0015], lines 16-19).

AAPA does not teach controlling the wafer temperature in response to heat flow from the chuck to the wafer.

Parkhe, in an analogous art, teaches controlling the wafer temperature within the temperature range in response to heat flow from the chuck 105 to the wafer 102 by including heater electrodes 222 in the chuck assembly 109, in which the heater electrode 222 would generate heat flow and transfer to the wafer 102 and thus to control the wafer temperature (col. 9, lines 18-29).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time of the invention was made to include heater electrodes, as taught by Parkhe, embedded in the chuck of AAPA, since by this manner it would generate uniform heat from the chuck to the wafer in properly controlling the wafer temperature (col. 9, lines 24-27, Parkhe).

In re claim 2, AAPA also teaches supporting the wafer 106 in a spaced apart relation from the chuck 126.

In re claim 3, AAPA also teaches that the wafer 106 is thermally coupled to the chuck 126 by radiant heat flow via heating gas (i.e. argon) (paragraph [0015]).

In re claim 4, AAPA further teaches that the wafer temperature is substantially determined by the radiant heat flow (i.e. the heating gas flow) since the wafer temperature is controlled by manipulating the heating gas flow (paragraph [0015]).

In re claim 5, one of the ordinary skill in the art would have recognized that the combined teachings AAPA in view of Parkhe would also teach the claimed limitations because both AAPA and Parkhe teach positioning the wafer at a distance from the target; and the wafer temperature exhibits a greater dependence on a chuck temperature, via the heating means 222 as in Parkhe, than on other parameters.

In claim 6, AAPA also teaches that the material is aluminum (paragraph [0015], line 16).

In re claim 10, AAPA teaches depositing material with a <111> crystal orientation on the wafer (paragraph [0019]).

In re claims 11 and 12, AAPA teaches depositing an underlying layer (i.e. titanium) on the wafer prior to depositing the material, wherein the underlying layer has a <002> crystal orientation (paragraph [0019]).

In re claim 13, AAPA teaches that the material exhibits a desired grain orientation of <111> (paragraph [0019]).

6. Claims 7-9 and 14-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Parkhe and Chen et al. (US 6,784,096).

In re claims 15 and 21, AAPA in view of Parkhe teaches the claimed physical vapor deposition chamber for depositing aluminum on a wafer, wherein the wafer temperature is maintained within a temperature range, comprising:

- a target 102 formed from the material to (i.e. aluminum) be deposited on the wafer 106;
- a chuck 126 for supporting the wafer 106; and
- a plurality of embedded chuck heaters when the embedded heater electrodes 222 of Parkhe are embedded in the chuck 126 of AAPA.

AAPA in view of Parkhe does not teach including a controller for controlling the chuck heater such that the wafer temperature is within the temperature range.

Chen et al., however, in an analogous art as shown in Fig. 4 and related text, teach the claimed physical vapor deposition chamber for depositing aluminum on a wafer, wherein the wafer temperature is maintained within a temperature range, comprising:

- a target 402 formed from the material to be deposited on the wafer 408;
- a chuck 454 for supporting the wafer 408; and
- a controller 330 for controlling the chuck temperature, which would maintain the wafer temperature within the desired temperature range (col. 13, lines 9-14).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time of the invention was made, to incorporate the controller, as taught by Chen et al. with the deposition apparatus of AAPA in view of Parkhe, since by this manner it would satisfactorily manipulate the chuck temperature and thus maintain the wafer temperature within the predetermined range, which in turn would be beneficial to the film deposition.

In re claim 16, AAPA also teaches that the wafer 106 is heated by radiant heat flow via heating gas (i.e. argon) from the chuck to the wafer (paragraph [0015]).

In re claim 17, AAPA in view of Parkhe also teaches that the chuck temperature substantially determines the wafer temperature because the embedded heater electrodes 222 in the chuck are used for controlling the wafer temperature.

In re claim 18, AAPA in view of Parkhe also teaches that the wafer 106 and the target 126 are disposed in a spaced-apart relation to permit a chuck temperature, as controlled by the chuck heater when the heater electrodes of Parkhe are embedded in the chuck of AAPA, to substantially control the wafer temperature.

In re claims 19 and 14, the selection of the space between the target and the wafer is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA

1980)(discovery of optimum value of result effective variable in a known process is obvious). In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. See M.P.E.P. 2144.05, III

In re claim 20, AAPA also teaches that a pedestal cover 128 covers the chuck 126, wherein the pedestal cover 128 comprises a plurality of pads 127 on the upper surface of thereof, and the wafer 106 is disposed on the plurality of pads 127 (Fig.2).

In re claims 22 and 7, the selection of the deposition temperature is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. For example, the deposition temperature is dependent upon the material to be deposited.

In re claims 23-24 and 8-9, these claims are *prima facie* obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). For example, one of the ordinary skill in the art would have been motivated to use the controller of Chen et al. in the apparatus of AAPA in

controlling the chuck temperature and thus to control the wafer temperature in response to a temperature measurement during the deposition.

In re claims 25-26, AAPA further teaches that the deposited material has a substantially <111> crystal orientation and a desired grain orientation (paragraph [0019]).

Response to Arguments

7. Applicant's arguments filed 2/4/2005 have been fully considered but they are not persuasive.

Applicant's argument is on the ground that AAPA does not teach controlling the wafer temperature within the temperature range in response to heat flow from the chuck to the wafer.

In response to the argument and amended limitation, Parkhe teaches including embedded heater electrode 222 in the chuck assembly 109, which would generate heat and transfer to the wafer and thus to control the wafer temperature. In other word, the wafer temperature is mainly dependent from the chuck temperature.

In response to applicant's arguments against the references (i.e. AAPA and Chen) individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-ming Lee whose telephone number is 571-272-1863. The examiner can normally be reached on Tuesday-Thursday (8:00 ~ 6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hsien-ming Lee
Primary Examiner
Art Unit 2823

April 12, 2005

HSIEN-MING LEE
PRIMARY EXAMINER

4/12/05